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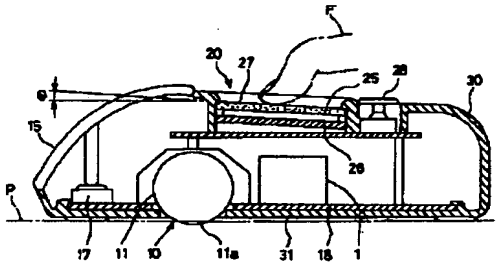
(54) DEVICE FOR INPUTTING COORDINATE

(57) Abstract:

PROBLEM TO BE SOLVED: To provide a coordinate inputting device which is provided with the function of a mouse or a track ball and the function of a finger pad which can be selectively used as necessary.

SOLUTION: A first coordinate inputting mechanism 10 which outputs information obtained from the rotation of a sphere 11 as coordinate data, and a second coordinate inputting mechanism 20 which outputs the change of the electrostatic capacity of plural electrodes accompanied with the movement of the finger F of an operator which is brought into contact with a face-shaped dielectric member 25 arranged between the plural electrodes as coordinate data are attached to a common casing 30 in a size which can be slide-operated on an operational face P in the hand of the operator.



[0023]

[Preferred Embodiment of the Invention]

Fig. 1 is a schematic vertical cross-sectional view of the structure of a coordinate input device in relation to an embodiment of the present invention. Fig. 2 is a plan view of the structure of a coordinate input device of Fig. 1. This coordinate input device is provided with a first coordinate input mechanism 10 and a second coordinate input mechanism 20 illustrated in Fig. 9.

[0024]

The first coordinate input mechanism 10 has a function to output the information obtained by rotation of a ball 11 as the coordinate data. This function is identical to that of the mouse and track ball which are known as the prior art. As is illustrated in Fig. 9, two kinds of rollers 12, 13 are in contact with a ball 11 in the first coordinate input mechanism 10, information about amount of rotation and rotating direction of ball 11 can be extracted through the rotating operation of the two kinds of rollers 12, 13 and the information extracted through such rotating operation is processed by the microcomputer (micon) MC and is then output as the coordinate data in the X axis and Y axis of the cursor on the display. The process by micon MC is conducted in a certain case in the CPU side.

[0025]

As illustrated in Fig. 1, a part of the ball 11 is exposed from the lower surface 31 of a casing 30. When an operator has the casing 30 with a hand and then slides the casing 30 on the manipulating surface P of the desk surface or exclusive pad, the exposed portion 11a of ball 11 rotates while it is in contact on the manipulating surface P.

[0026]

As illustrated in Fig. 9 and Fig. 10, the second coordinate input device 20 is formed by extending a rectangular shape dielectric material 25 for over the four electrodes 21, 22, 23, 24. Moreover, this mechanism also has a function to output, as the coordinate data, the change of electrostatic capacitance of the electrodes 21, 22, 23, 24 due to the movement of finger (not illustrated) of an operator touched on the dielectric member 25. Such function is similar to the function of the finger pad of the related art.

[0027]

As this second coordinate input device 20, the device disclosed in the Japanese Published Unexamined Patent Application No. HEI 8-171449 may be used. This reference describes the coordinate input device having the structure that the dielectric member 25 is extended in lateral over the bar type four electrodes 21, 22, 23, 24 which are formed in the equal angle (90 degrees) as the printing pattern on the printed wiring board 26 and a contact plane 27 which is touched by a finger F of operator (refer to Fig. 1) is formed to this dielectric member 25. The contact plane 27 is formed by the surface of dielectric member 25 or is formed by a film laminated on the dielectric member 25.

[0028]

As illustrated in Fig. 9, charges of AC125 kHz is applied respectively to the four electrodes 21, 22, 23, 24 of the second coordinate input device 20. Therefore, when an operator touches on the contact plane 27 with a finger, electrostatic capacitance can be obtained depending the distance between the electrodes 21, 22, 23, 24 and finger

F, a signal based on change of electrostatic capacitance is converted to an analog data and such analog data is processed by micon MC and is then output as the coordinate data in the X axis and Y axis of the cursor on the display.

[0029]

The casing 30 is formed in such a size for enabling an operator to have it by a hand and then to slide it on the manipulating plane P and the second coordinate input device 20 is mounted to the casing 3 together with the first coordinate input mechanism 10. The mounting area of the second coordinate input mechanism 20 is selected as the area where the dielectric member 25 is exposed in the upward direction from the upper surface of the casing 30.

[0030]

As explained above, it is an object of the present invention to provide a coordinate input device which can adequately select the functions by providing the mouse or track ball function and finger pad function to only one device and therefore it is not the object to disclose the detail structure of the first coordinate input device 10 and second coordinate input device 20 and also disclose the mounting structure of these mechanisms to the casing 30. Therefore detail explanation thereof is omitted.

[0031]

As illustrated in Fig. 1, the contact surface 27 of the dielectric member 25 with the finger of operator is tilted as much as θ for the manipulating plane P. As explained above, the contact surface 27 is tilted, because the moving path of finger can be determined naturally on the contact surface 27 to improve flexibility and also assure the accurate manipulation when a user moves his finger touching on the contact surface 27. Therefore, so long as the contact surface 27 is tilted for such purpose, the contact surface 27 may be tilted to become higher when it goes forward in the relevant apparatus as illustrated in Fig. 1, or to become lower when it goes backward although not illustrated, or to become higher when it goes to the left, or to become higher when it goes to the right, or may be tilted in different manner. The practical value of inclination angle θ may also be selected in various values.

[0032]

In Fig. 1 and Fig. 2, numerals 15, 16 designate a definition switch added to the first coordinate input device 10 or a manipulating member for cancel switch; 17, a definition switch or cancel switch manipulated by one manipulating member 15; 18, a circuit substrate in the side of the first coordinate input device 10. Moreover, 28, 29 are definition or cancel switch added to the second coordinate input device 20. Moreover, 1 is an X-Y direction sensor housing.

[0033]

The switch S1 illustrated in Fig. 9 is a selection switch to select the coordinate data to be processed by the micon MC from the coordinate data of the first coordinate input device 10 and the second coordinate input device 20. The switch contact S2 illustrated in Fig. 2 or Fig. 9 is changed over by manipulating the switch S1 to change over the feeding destination of the Vcc (power supply voltage).

[0034]

In this coordinate input device, the first coordinate input mechanism 10 has the function as the mouse or track ball of the prior art and the second coordinate input mechanism 20 has the function as the finger pad of the related art explained above.

[0035]

On the occasion of using the coordinate input device explained above, when the manipulation space of sufficient area to slide the existing mouse is acquired, it is enough that an operator has the casing 3 with a hand under the condition that the processing

mode of the micon MC is set to the mode to process the first output mode with the switch S1 and then move the ball 11 by sliding the casing on the manipulating plane P. Thereby, the cursor of the display can be moved by utilizing the function of the first coordinate input mechanism 10.

[0036]

When the coordinate input device is required to be manipulated in the area where the manipulating space of sufficient area to slide the existing mouse is not yet acquired or when malfunction resulting from contamination of the ball 11 is generated during use of the first coordinate input mechanism 10, it is enough that an operator touches on the contact surface 27 of the dielectric member 25 of the second coordinate input mechanism 20 with a finger to move this finger under the condition that the casing 30 is put at the fixed position and the processing mode of the micon MC is set by the switch S1 to the mode to process the second output mode. Thereby, the cursor of display can be moved by utilizing the function of the second coordinate input mechanism 20.

[0037]

Moreover, since an operator can freely and selectively operate the first coordinate input mechanism 10 and the second coordinate input mechanism 20, an operator who is not skillful to manipulated the mouse of the related art can use the function by manipulating the second coordinate input mechanism 20. On the contrary, an operator who is not skillful to manipulate the film pad of the related art can use the function using the first coordinate input mechanism 10.

[0038]

In this coordinate input device, a part of the ball 11 of the first coordinate input mechanism 10 having the function as the existing mouse is exposed to downward from the lower surface of the casing, but the dielectric member 25 of the second coordinate input mechanism 20 having the function as the existing finger pad is exposed from the upper surface of the casing 30. Therefore, it is no longer required to change the attitude of the relevant device when using the function of the first coordinate input mechanism 10 and the function of the second coordinate input mechanism 20. Accordingly, it is the merit that while the relevant device is placed, for example, on the desk surface, the function of the first coordinate input mechanism 10 and the second coordinate input mechanism 20 can be used.

[0039]

In addition, since the contact plane 27 of the second coordinate input mechanism 20 is tiled in the direction along the moving path of the finger of operator manipulating the contact surface 27, manipulation flexibility of operator can be improved and accurate manipulation can be realized easily.

[0040]

In the embodiment explained with reference to Fig. 1 and Fig. 2, the contact surface 27 of the second coordinate input mechanism 20 is always exposed to the external side. Therefore, it is probable that a finger of the operator hits the contact surface 27 to contaminate the contact surface 27 when an operator is manipulating the relevant device by utilizing the function of the first coordinate input mechanism 10. In order to eliminate such fear, it is effective to cover the contact surface 27 with a cover when the function of the second coordinate input mechanism 20 is not utilized. Such embodiment is illustrated in Fig. 3 to Fig. 5.

[0041]

Fig. 3 is a schematic vertical cross-sectional view illustrating the structure of the coordinate input device in relation to the other embodiment of the present invention. Fig. 4 is a plan view illustrating the structure of the coordinate input

device of Fig. 3. Fig. 5 is a plan view illustrating the structure of the coordinate input device of Fig. 4 in the condition that the cover 40 is opened.

[0042]

In this coordinate input device, the fact that the first coordinate input mechanism 10 and second coordinate input mechanism 20 illustrated in Fig. 9 are provided in the casing 3, function and structure of these coordinate input mechanisms 10, 20, assembling structure of the first coordinate input mechanism 10 and second coordinate input mechanism 20 for the casing 30 and manipulating method of the first coordinate input mechanism 10 and second coordinate input mechanism 20 are similar to those explained in regard to Fig. 1, Fig. 2, Fig. 9 and Fig. 10.

[0043]

In this coordinate input device, the cover 40 is formed in the shape to cover the entire part of upper part of the casing 30 and the front end part of the casing 30 is coupled with the front end part of the cover 20 with a hinge mechanism 41. Accordingly, when the cover 40 is closed, the contact surface 27 in contact wit a finger of an operator of the dielectric member 25 in the second coordinate input mechanism 20 is covered with the cover 40 as illustrated in Fig. 3 and Fig. 4. Under this condition, a finger of an operator is never in contact with the contact surface 27 when the function of the first coordinate input mechanism 10 is utilized. Moreover, since total shape of the relevant device may be finished in the shape similar to the shape of mouse at the time of adequately selecting the shape of cover 40 mounted to the casing 20, an operator can utilize the function of the first coordinate input mechanism 10 without any sense of incongruity.

[0044]

When the cover 40 is opened, as illustrated in Fig. 5, the contact surface 27 of the second coordinate input mechanism 20 is exposed to the upper part of the casing 30. Therefore, an operator is capable of utilizing the function of t he second coordinate input mechanism 20 by manipulating the contact surface 27 with a finger.

[0045]

As is explained with reference to Fig. 3 to Fig. 5, when the cover 40 which is closed and opened between the opening and closing positions is fitted to the casing 30 via the hinge mechanism 41, application flexibility may be improved by giving the automatic opening function of cover 40 to the hinge mechanism 41. An embodiment having such function is illustrated in Fig. 6 and Fig. 7.

[0046]

Namely, Fig. 6 is a schematic perspective view illustrating the structure of the coordinate input device in relation to the other embodiment of the present invention. Fig. 7 is a schematic perspective view illustrating the structure in the condition where the cover 40 of the coordinate input device of Fig. 6 is opened.

[0047]

In the coordinate input device of this embodiment, the hinge mechanism 41 is provided with a spring member 42 to always energize the cover 40 in the opening direction. Moreover, this coordinate input device is provided with engaging/disengaging mechanism 50 at the rear end part of the casing 30 and the rear end part of the cover 40. As illustrated in Fig. 8, the engaging/disengaging mechanism 50 is mounted at the internal side of the casing 30 and is provided with a pawl piece 51 projected upward of the rear end part of the casing 30, a push button 52 provided integrally with the pawl piece 51 and inserted to the opening 32 opened at the casing 30 and an engaging part 42 provided at the internal side of the rear end part of the cover 40. In this engaging/disengaging mechanism 50, when the cover 40 is closed up to the area near the closing position against

activation of the spring member 42 of the hinge mechanism 41, the rear end part of cover 40 pushes the pawl piece 51 to be warped as indicated by a virtual line. When the cover 40 reaches the closed position, its pawl piece 51 recovers to the original position with its elasticity, resulting in engagement with the engaging portion 42 as indicated by a solid line. This condition is called the locked condition. When the push button 52 is pushed with a finger F from this locked condition to warp the pawl piece 51 as indicated by a virtual line, the pawl piece 51 is disengaged from the engaging portion 42 (lock canceling condition) and the cover 40 is automatically opened with activation of the spring member 42.

[0048]

As explained above, the hinge mechanism 41 is provided with the spring member 42 to always activate the cover 40 in the opening direction and moreover the engaging/disengaging mechanism 50 is provided to result in the unlocked condition with the pushing manipulation of the push button 52 and locked condition when the cover 40 is closed to the closing position, when it is requested to use the function of the second coordinate input mechanism 20, the cover 40 is automatically opened momentarily only by pushing the push button 52 to use the function of the second coordinate input mechanism 20. Thereby, application flexibility can be improved.

[0049]

In explanation with reference to Fig. 3 to Fig. 7, the cover 40 is coupled wit the casing 30 via the hinge mechanism 41. However, it is also possible that the cover not coupled with the casing 30 is removably mounted to the casing 30.

[0050]

Moreover, in the respective embodiments explained with reference to Fig. 3 to Fig. 7, the manipulating members 15, 16 are mounted to the side of cover 40, it is naturally possible that these manipulating members 15, 16 are mounted to the side of casing 30 and openings for exposing the manipulating members 15, 16 when the cover 40 is closed is provided in the side of cover 40.

[0051]

Moreover, in each embodiment explained above, the mechanism having the function of the related mouse has been explained as the first coordinate input mechanism 10, it is naturally possible to provide the function of the track ball of the related art to this first coordinate input mechanism 10.

[0052]

In Fig. 1 to Fig. 10, the same or similar element is designated by the like reference numeral and the detail explanation is omitted here. Moreover, it is possible to provide the casing or cover for the switch S1 in each embodiment explained above.

[0053]

In the coordinate input device of the present invention, it is also possible to add the remote control function utilizing the infrared ray system. In addition, the coordinate input device of the present invention can be used not only for so-called personal computer but also for so-called Internet television. When the input device is used in connection with these elements explained above, it is preferable to add the change-over switch for personal computer and Internet television. Moreover, the coordinate input device of the present invention may be formed to be removably mounted to keyboard of personal computer and in this case, the second coordinate input device 20 is used as the keyboard comprising type device.

[0054]

[Effect of the Invention]

The coordinate input device of the present invention has the function as the

mouse or track ball explained first and the function of the finger pad and it can freely select any function of those explained above. Accordingly, when the first coordinate input mechanism has the function of mouse, an operator who is not skillful in manipulation of existing mouse can manipulate the second coordinate input mechanism in the existing finger pad manipulation method. On the contrary, an operator who is not skillful in manipulation of the existing finger pad is capable of manipulating the first coordinate input mechanism in the existing mouse manipulating method. Therefore, an operator can select the manipulating method depending on his selection.

[0055]

In addition, when sufficient area cannot be attained to manipulate the first coordinate input mechanism, the coordinate data can be output by utilizing the function of finger pad.

[0056]

Moreover, since coordinate data can be output by utilizing the function of finger pad when malfunction is generated due to contamination of the first coordinate input mechanism, application flexibility may be improved and the function to output the coordinate data of the relevant device as a whole can be assured adequately for a longer period of time.

[0057]

Above explanation can also be applied when the first coordinate input mechanism has the function of the track ball.

[0058]

The coordinate input device of the present invention can be removably mounted to the keyboard of the so-called notebook size personal computer.

[Brief Description of the Drawings]

[Fig. 1]

Schematic vertical cross-sectional view illustrating the structure of the coordinate input device in relation to an embodiment of the present invention.

[Fig. 2]

Plan view illustrating the structure of the coordinate input device of Fig. 1.

[Fig. 3]

Schematic vertical cross-sectional view illustrating the structure of the coordinate input device in relation to the other embodiment of the present invention.

[Fig. 4]

Plan view illustrating the structure of the coordinate input device of Fig. 3.

[Fig. 5]

Plan view illustrating the structure of the coordinate input device of Fig. 4 under the condition that the cover is opened.

[Fig. 6]

Schematic perspective view illustrating the structure of the coordinate input device in relation to the other embodiment of the present invention.

[Fig. 7]

Schematic perspective view illustrating the structure under the condition that the cover of the coordinate input device of Fig. 6 is opened.

[Fig. 8]

Cross-sectional view illustrating the engaging/ disengaging mechanism.

[Fig. 9]

Diagram illustrating an example of a circuit structure for outputting the coordinate data.

[Fig. 10]

Diagram for explaining the essential portion of the second coordinate input mechanism.

[Description of the Reference Numerals]

10: First coordinate input mechanism;
11: Ball;
20: Second coordinate input mechanism;
21,22,23,24: Electrode;
25: Dielectric member;
30: Casing; 31: Lower surface of casing;
40: Cover; 41: Hinge mechanism;
50: Engaging/disengaging mechanism;
52: Push button; F: Operator's finger;
P: Manipulating surface;